DOCUMENT RESUME

ED 415 346 CE 075 443

AUTHOR Snydar, Sean
TITLE Training over the Intranet--A Shockwave Case Study.
PUB DATE 1997-12-00
NOTE 7p.; Paper presented at the Interservice/Industry Training, Simulation and Education Conference (19th, Orlando, FL, December 1-4, 1997).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Authoring Aids (Programming); Case Studies; *Computer Assisted Instruction; Computer Uses in Education; *Corporate Education; Courseware; *Delivery Systems; Equipment Maintenance; Industrial Training; Instructional Development; Multimedia Instruction; Postsecondary Education; Technical Education; *World Wide Web
IDENTIFIERS *Boeing Company; *Intranets

ABSTRACT

This case study explains how the Boeing Company has used the World Wide Web to deliver flight and maintenance computer-based training (CBT) that was originally created on a Macintosh computer and converted to Windows format. The case study begins with a brief discussion of the advantages of using corporate and institutional internal networks (intranets) to deliver multimedia-rich CBT. Presented next is basic information about the authoring software (Authorware 4.0 and Shockwave for Authorware) used to develop Boeing's courseware and the relatively small UNIX server that is currently being used to using to deliver ("serve") the CBT. Special attention is paid to storing Shockwave for Authorware files and configuring a web server for their delivery. The remaining sections of the case study detail the solutions used by Boeing to overcome the following challenges of delivering CBT in an intranet environment: extensive use of content libraries, external text files, full audio, large bitmap graphics, and numerous animations. The solutions described confirm that, with improvements to Authorware and the appropriate hardware infrastructure, it is fairly easy to achieve CD-ROM-quality courseware in an intranet environment. (MN)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 415 346

TRAINING OVER THE INTRANET - A SHOCKWAVE CASE STUDY

Sean Snydar
The Boeing Company
Seattle, Washington

ABSTRACT

Using the Web for delivery of computer based training (CBT) has a number of well documented and appealing advantages. These include use of existing networks with no special hardware requirements, access when and where end users want ("just in time training"), easy updating of instructional content, and elimination of costly printed material or CD-ROMs. The current bandwidth limitations of the Internet make delivery of dynamic, graphically intense, interactive CBT difficult if not impossible. However, corporate and institutional intranets are well suited for delivery of multimedia rich CBT. The Boeing Company currently has approximately 2.5 gigabytes of 777 Flight and Maintenance Computer Based Training with individual lessons varying in size from 3 megabytes to over 50 megabytes. The 777 CBT, developed originally in Authorware for Macintosh Version 2.0, presents several challenges for delivery in an intranet Web environment including extensive use of libraries, external text files, full audio, large bitmap graphics, and numerous animations. Using Authorware 4.0 and Shockwave for Authorware it is possible to deliver this CBT on the internal Boeing network (intranet). Any of the over 200,000 Boeing employees will have access to this CBT seamlessly from either Mac or PC workstations with performance equivalent to CD-ROM delivery. With the 777 CBT as a case study, this paper describes the process for creating Shockwave content and the most common technical problems associated with intranet delivery of large-scale CBT and solutions to those problems.

BIOGRAPHY

Sean is a CBT Programmer with The Boeing Company where his responsibilities include developing the next generation of 737 computer based training and implementing the current 777 CBT courseware on the company intranet. He also teaches computer related courses on the Boeing Education Network (closed circuit interactive television).

Sean is a graduate of the University of Puget Sound with Bachelor of Science degrees in Computer Science and Mathematics.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☑ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL HAS BEEN GRANTED BY
S. Snydar
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

CE075743

BEST COPY AVAILABLE

TRAINING OVER THE INTRANET - A SHOCKWAVE CASE STUDY

Sean Snydar
The Boeing Company
Seattle, Washington

INTRODUCTION

Using the Web for delivery of computer based training (CBT) has a number of well documented and appealing advantages. These include use of existing networks with no special hardware requirements, access when and where end users want ("just in time training"), easy updating of instructional content, and elimination of costly printed material or CD-ROMs. Corporate and institutional intranets are well suited for delivery of multimedia rich CBT as they often lack the bandwidth limitations of the Internet. The Boeing Company currently has about 2.5 gigabytes of 777 Flight and Maintenance CBT. The courseware was originally created on a Macintosh and then converted to Windows format. It runs at a large screen resolution of 1024 X 768 at 256 colors. The courseware presents several other challenges for delivery in an intranet environment including extensive use of content libraries, external text files, full audio, large bitmap graphics, and numerous animations. Using Authorware 4.0 and Shockwave for Authorware it is possible to deliver this CBT on the internal Boeing network (intranet). Any of the over 200,000 Boeing employees will have access to this CBT seamlessly from either Mac or PC workstations with performance equivalent to CD-ROM delivery. With the 777 CBT as a case study, this paper describes the process for creating Shockwave content and the most common technical problems associated with intranet delivery of large-scale CBT and solutions to those problems.

A Quick Word About Authorware 4.0

The release of Authorware version 4.0 offers some significant enhancements over 3.5. The major improvement in 4.0 is binary file compatibility. This means that one version of the file works on both Macintosh and Windows. Also, the file compression technology of the Afterburner has been incorporated into 4.0. However, the topics discussed in this paper also apply directly to Authorware 3.5.

What is Shockwave for Authorware?

Shockwave for Authorware is a 2 part software that enables web browsers to run Authorware pieces. The first part of Shockwave is the Afterburner. The job of the Afterburner is to segment the original Authorware piece into small web deliverable chunks. The other part is a browser plugin that controls the downloading of the individual segments. The plugin also decodes the compressed segments. . The Afterburner and the plugin are available from the Macromedia web site at "www.macromedia.com/Shockwave/".

SHOCKWAVE SERVER BASICS

The 777 shocked CBT is delivered from a Sun SPARC 20 with two 60 mhz chips and 384 megabytes of RAM running NCSA We'ɔ server software. This is a somewhat small UNIX server that meets current demands. Running the CBT on a UNIX server allows for simple migration to more powerful UNIX machines as the demand increases. Simply copy the entire web server and associated files to the new server. .However, after testing the 777 CBT on many different platforms, more performance gains are found by increasing the power of the client machine. Faster client machines are able to decode and begin playing the compressed segments much quicker. There are noticeable performance differences between a 486 66 MHz machine and a Pentium 120 MHz machine, both running the same course from the same server. The Pentium 120 achieves CR-ROM type speed.

It is possible so serve Shocked Authorware files from a Windows or Macintosh server, though performance will suffer with larger courses and higher demand.

When storing Shocked Authorware 3.5 files, you can expect compression from 40% - 70%. Remember that the compression technology is incorporated into Authorware 4.0 and you can expect the same compression when converting from Authorware 3.5 to 4.0. The Shocked 777 lessons are about one-third the size of the

originals and the entire web course is only 1 gigabyte.

Configuring the Web Server

To deliver or "serve" Shockwave for Authorware applications, the web server you are using must be properly configured. To configure your web server, you or your server administrator will need to make the appropriate changes to the file that contains the MIME type settings. Without the proper settings in the MIME file, the web server will not communicate properly with client web browsers. As a result, the browser will not launch the Shockwave for Authorware plugin (see Table 1).

MIME type:	application
Sub type:	x-authorware-map
Extension:	aam
MIME type:	application
Sub type:	x-authorware-seg
Extension:	aas
MIME type:	application
Sub type:	x-authorware-bin
Extension:	aab

Table 1. Shockwave for Authorware mime types.

WEB DELIVERY

Creating Shockwave for Authorware pieces

The 777 courseware was originally created in Authorware 2.0 for the Macintosh. In order to play this CBT on the Web, it had to be converted to Authorware 3.5. It was then converted to Authorware 4.0 - there is no direct conversion from 2.0 to 4.0. Also, all the conversions were done on the Windows platform. When Authorware went from version 2.2 to 3.0, the base code was transferred to Windows. That is, Authorware 2.2 was a Macintosh product converted to Windows, and Authorware 3.0 and higher is a Windows product converted to Macintosh. Consequently, the 777 courseware converted with no problems on Windows, while converting on the Macintosh was problematic.

The conversion process required only one code change to correct a bug in Authorware 2.0. All other features of the courseware work perfectly in an intranet environment. The primary reason for this success is that existing Authorware functions have been enhanced to work over the intranet/Internet. For example, the functions JumpFileReturn, and ReadExtFile now accept URLs as arguments. Also, several new Web specific functions have been added, such as GoToNetPage and NetDownLoad.

Note however that the 777 CBT uses none of the new Internet features of Authorware. This is a significant point and indicates the power of Shockwave for Authorware, particularly for leveraging existing courseware. The 777 CBT went from an expensive to reproduce CD-ROM application with copies sent only to those with specific need, to an easy to deliver web-based application accessible by anyone inside Boeing. Now any engineer or mechanic can access the lessons they need instantaneously without formal requests.

If you are using Authorware 3.5, you can use either the Windows or the Macintosh version, but remember that 3.5 is platform specific, so if you want your Shocked Authorware piece to be playable on both Macintosh and Windows, you must convert to the other platform. What this means is you will do everything twice, once on each platform. Though you create two separate shocked pieces, it is transparent to the end-user. The plugin decides which version to use.

Afterburner Process

After all the parts of your piece have been packaged, you are ready to Afterburn. The primary function of Afterburning is to segment the compressed files into many small pieces to facilitate web delivery. (If you are using Authorware 3.5, the Afterburner also compresses the files.).

The Afterburner produces two main types of files and a third type on the Macintosh. These are segment files with the .aas extension, map files with the .aam extension, and, on the Macintosh, binary files with the .aab extension.

There are several important items to remember when Afterburning. First, keep the .aam extension on the map file, as this matches the extension that was added to the MIME type file of the web server.
Next, a single directory works best to store each map file and its associated segment files. All the 777 courseware is stored in one directory with separate subdirectories for each lesson. Finally,

BEST COPY AVAILABLE

when choosing the first 4 characters of the segment names, use meaningful characters and if you are using Authorware 3.5 and your piece is both Macintosh and Windows, you can not use the same 4 characters on both platforms. Starting or ending Macintosh segments with an 'm' and Windows segments with a 'w' may be helpful.

Libraries

Your piece can be packaged with or without any external libraries. Libraries are excellent for storing content (sounds, graphics, etc.) that is used in different pieces, or for content that is used repeatedly within the same piece. Each 777 CBT lesson uses two external libraries, one for audio and one for graphics. Since these libraries are used only by one lesson, they are packaged internally for web delivery. This decreases the number and types of files to manage and more significantly, simplifies the map file. If you choose to package without libraries, then you must create a packaged version of every library. Leaving the libraries external can give you more flexibility as other Authorware pieces can use these same libraries. External library file names should differ from the main file name or the Afterburner process can overwrite previous files. (Example: sample.a3w and sample.a3l will both produce sample.aam.)

Optimal Segment Size

Finally, you must choose a segment size in bytes. The default is 16000 (16K). Determining the optimal segment size is going to take some experimentation. The idea is to find a balance between download time and the number of downloads. The 777 CBT uses 250000 (250K) segments. This is a rather large segment, but the strength of the Boeing Intranet easily handles delivering them. There is a slight delay at the beginning of each lesson as 5-7 segments are downloaded to begin playback, but then the downloads happen quickly with no significant interruptions. Again, do some experimenting, try a mix of segment sizes to see what works best with your piece and hardware configuration. As a rule, start with larger segment sizes and work down if performance is not acceptable. Remember that Shockwave for Authorware is not streaming, but rather is downloading small segments as they are needed.

There are a number of things to consider. The most important is the strength of your intranet. An intranet with a strong infrastructure, Ethernet or better, can support larger segments. If your intranet is weaker or must support dial-up, then you should use smaller segments. Another item to consider is the size of your web server and the demand placed on it. A large dedicated UNIX server can handle bigger segments than a web server running from your desktop PC. And of course you must take into account the speed of the client machines. Also consider the complexity of your Authorware piece. Large bitmap graphics, animations, or audio files generally require bigger segments. It is irritating to have sound files stop in the middle, download the next segment, and then start again.

Map Files

Map files contain the directions for the plugin. It is a text file that the plugin reads to determine what segments and other content need to be downloaded. Chances are that your map file will need editing. This is definitely true if your piece is to run on both Macintosh and Windows (see Combining Map Files). Even if this is a single platform piece, you may have external content like text files or movies that need to be downloaded. For example, each 777 CBT lesson uses several external text files. The map file must be modified to handle these files. The map file can be edited directly in the Afterburner application or using any text editor. Using the Afterburner to edit the map file is like using a wizard, you simply fill in the necessary information as prompted. This works good if you are new to editing map files. More experienced users may prefer the freedom of a text editor. Below (see Figure 1) is a sample map file from a shocked 777 Authorware 4.0 lesson.

```
ver  0     4
get  .
put  DOWNLOAD
# download content segments
seg  all   091u0000.aas   0         258794
seg  all   091u0001.aas   258794    263064
seg  all   091u0002.aas   521858    253627
seg  all   091u0003.aas   775485    244077
seg  all   091u0004.aas   1019562   250374
# change path to the plugins directory
put  .
# download external text files - glossary, audio script, menu
bin  all   "091uad.spt"   "091[illegible].spt"
bin  all   "091uad.mnu"   "091uad.mnu"
bin  all   "091uad.glo"   "091uad.glo"
```

Figure 1. 777 CBT Authorware 4.0 map file.

A detailed description of each line in a map file can be found at the Macromedia web site at "www.macromedia.com/support/authorware/".

BEST COPY AVAILABLE

Flattening External Content (Macintosh only)

A unique feature of the Macintosh Afterburner is the Flattener. The Flattener is used preserve the resource fork information (type and creator) for a Macintosh file. This is necessary on most Macintosh specific external content files. The flattening process creates files with the .aab extension. Text files generally do not need to be flattened, nor does any file that runs on both Macintosh and Windows.

Because Windows does not understand flattened files, if you want to share Macintosh external content with Windows add the type and creator options directly to the map file content line. For example:

```
bin all   testfile.srv   testfile.lcl   type='tttt',creator='cccc'
```

A flattened file must be decoded by the plugin, this takes time. Using the type and creator options might improve performance on the Macintosh. Also, you may find that a separate content file for each platform is less problematic. Do some experimenting to check the performance and quality of your piece.

Create an HTML Page

In order to display your Shocked Authorware lesson, you must create an HTML web page that references the shocked file. The 777 CBT lessons are called with the following HTML code:

```
<EMBED SRC="012uaa.aam" WIDTH=1024 HEIGHT=768
WINDOW=ONTOP>
```

where "012uaa.aam" is the name of the map file, the window size is 1024 X 768 and the display window is 'ONTOP' of the browser. Other display window options are 'INPLACE', inside the browser window, and 'ONTOPMINIMIZE', minimize the browser window. Some other helpful items to add to your web page are a title, some text with a lesson description, and a back, return, or other navigation button.

CROSS PLATFORM DEVELOPMENT

Fonts

You must carefully consider your use of fonts in any Authorware piece you plan for web delivery. Since this generally means both Macintosh and Windows, you can either stick to the standard fonts and use the font mapping feature of Authorware to control which fonts are substituted on the other platform, or use custom fonts that exist on both platforms. Both methods have their drawbacks.

Using just the standard fonts can seriously effect the look of your piece, especially across platforms. The standard Windows fonts are Arial, Courier New, Symbol, Times New Roman, and Wingdings. The standard Macintosh fonts are Chicago, Courier, Geneva, Helvetica, Monaco, New York, Palatino, Symbol, and Times.

Custom fonts present another problem.. The Macintosh platform is easy, simply select the "package with fonts" option when you package your finished piece. This ensures all necessary fonts will be available on the local machine.

Unfortunately, Windows does have such an option. If you use custom or non-standard fonts you must create a separate font installation program that installs these fonts on the local machine. This is the case with the 777 CBT, the courseware was developed using Macintosh fonts. Windows versions of the Macintosh fonts were created and installed on all Windows-based platforms. For intranet delivery, a self-extracting zip file with the font installation routine was created. This file is about 300K and must be downloaded and executed before running the 777 CBT. Fortunately, users only have to download and install the fonts one time.

DLLs

Remember that DLL are platform specific - a 16 bit DLL will not work with the 32 bit version of Authorware (both 3.5 and 4.0) and vice versa. However, there is a 16 bit version of the Authorware runtime in both 3.5 and 4.0 that can run 16 bit DLLs Generally though, you will need both 16 and 32 bit versions of all DLLs.. The Afterburner will add references to DLLs in the map file, however the map file may need modifying to handle all possible platforms. Another solution, and the one used with the 777 CBT, is to remove all use of DLLs from the application. For example, some original lessons contained a DLL to return the screen coordinates of a mouse click. In Authorware 2.0, the DLL was much faster than the equivalent Authorware code. Speed improvements in Authorware 3.5 and 4.0 made the DLL obsolete, and it was replaced with Authorware calculations.

Combining Map Files

In order to create a Shocked Authorware 3.5 piece that runs seamlessly on both Macintosh and Windows, you must combine the platform specific map files into one map file. This can be done either with the Afterburner or a text editor. Simply copy all the contents from one map file and paste into the other map file. Save the resulting map file with a new name. This preserves the original for later reference or troubleshooting. Now delete or combine any duplicate entries, such as extra 'put' or 'get' commands. A good idea is to match the format originally created by the Afterburner. Below is a sample combined 777 lesson Authorware 3.5 map file. (see Figure 2).

```
ver  0 3
get  .
put  DOWNLOAD
#Download Mac segments
seg  mac   011m0000.aas    0        251198
seg  mac   011m0001.aas    251198   254659
seg  mac   011m0002.aas    505857   250861
#Download Windows segments
seg  win   011w0000.aas    0        254140
seg  win   011w0001.aas    254140   255707
seg  win   011w0002.aas    509847   250861
#Change paths to the Plugins directory
put .                .
#Download text files
bin  win   011baa.mnu      011baa.mnu
bin  win   011baa.spt      011baa.spt
```

Figure 2. Cross-Platform 777 CBT Authorware 3.5map file.

Getting a cross-platform map file to work correctly can be frustrating. Make sure the original Macintosh and Windows map files work before attempting to combine them. Also, it is a good idea to store all the segment and external content files in one directory. This eliminates the need for platform specific 'get' commands.

SUMMARY

Delivery of the 777 courseware on the Boeing intranet demonstrates the feasibility of multimedia rich web based instruction. With the improvements to Authorware and the appropriate hardware infrastructure, it is fairly easy to achieve CD ROM quality with net based courseware.